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Forensic Engineering and Visualization

3794 Shields  
November 18, 2019

## Engineering Report

Steve Emery  
Williams Porter Day & Neville  
159 N Wolcott St.  
Suite 400  
Casper, WY 82601

Case Name: Shostak v. Wallers Trucking  
Date of Incident: June 28, 2017

Dear Mr. Emery:

As requested, Kineticorp has conducted an investigation of a two commercial vehicle accident that occurred near mile post 50 on Interstate Highway 80 (I-80) in Lyman, Wyoming. The vehicles involved were a 2016 Freightliner Cascadia, driven by Pavlo Shostak and operated by Carolina Logistics Inc, and a 1996 Kenworth W900B, driven by Jason Buck and operated by Waller's Trucking. As part of this analysis, several documents were provided and reviewed which are listed in Appendix A at the end of this report.

**Background:** According to the Wyoming Investigator's Traffic Crash Report, case no. P2017095166, at approximately 7:20 AM both vehicles were traveling east on I-80. The Kenworth, driven by Mr. Buck, had just finished obtaining asphalt from the construction being performed on I-80, and was traveling slowly in the right lane outside the construction zone hauling two loaded open-top trailers. The Freightliner, driven by Mr. Shostack and hauling a loaded refrigerated dry van trailer, came upon the Kenworth in the right lane and began to change lanes to the left to pass the Kenworth. The collision occurred when the Kenworth turned to the left to make a U-turn using the median cross-over: the Freightliner struck the driver side of the Kenworth as it crossed lane #1 and entered the cross-over. After the impact both the Freightliner and the Kenworth came to rest in the cross-over area.

An aerial view taken from Google shows the approximate area of impact (AOI) near mile post 50 denoted by the yellow circle in Figure 1. I-80 is an interstate highway running east and west with an 80 mph speed limit. There are two travel lanes both east and westbound, which are separated by a grass median. Near the area of the accident there is a cross-over lane for emergency and authorized vehicles. A close up of the AOI and cross-over area is shown in Figure 2.

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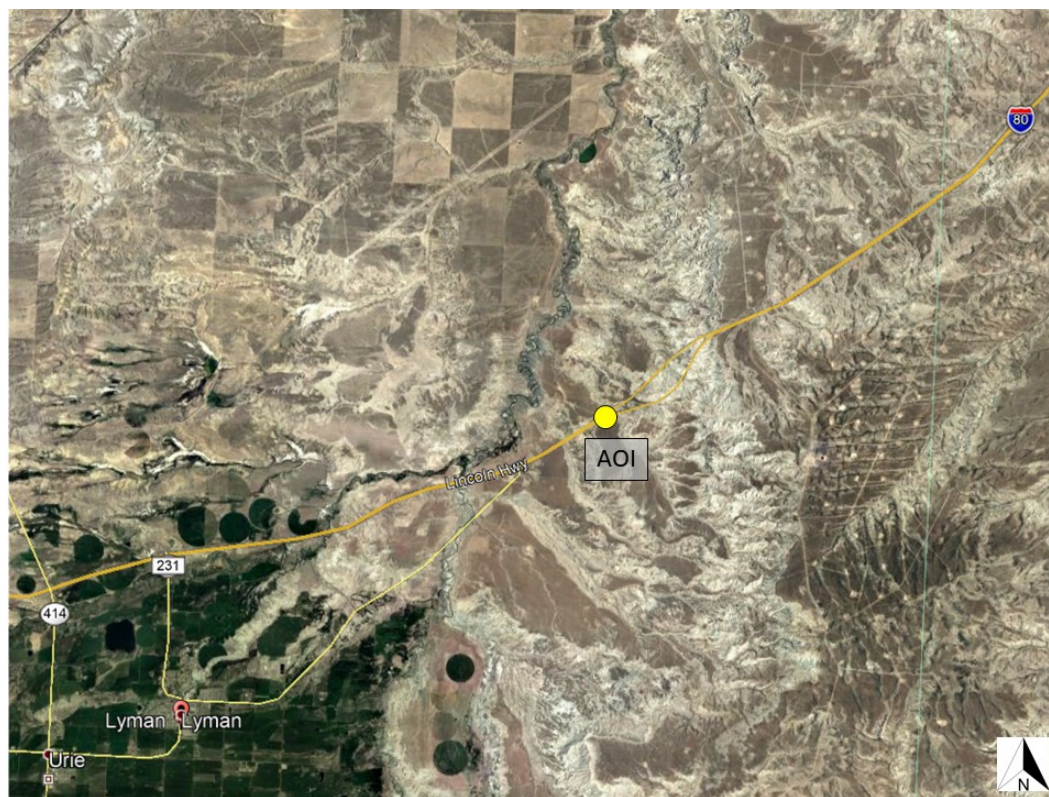


Figure 1 - Aerial View of the Accident Location (Google)

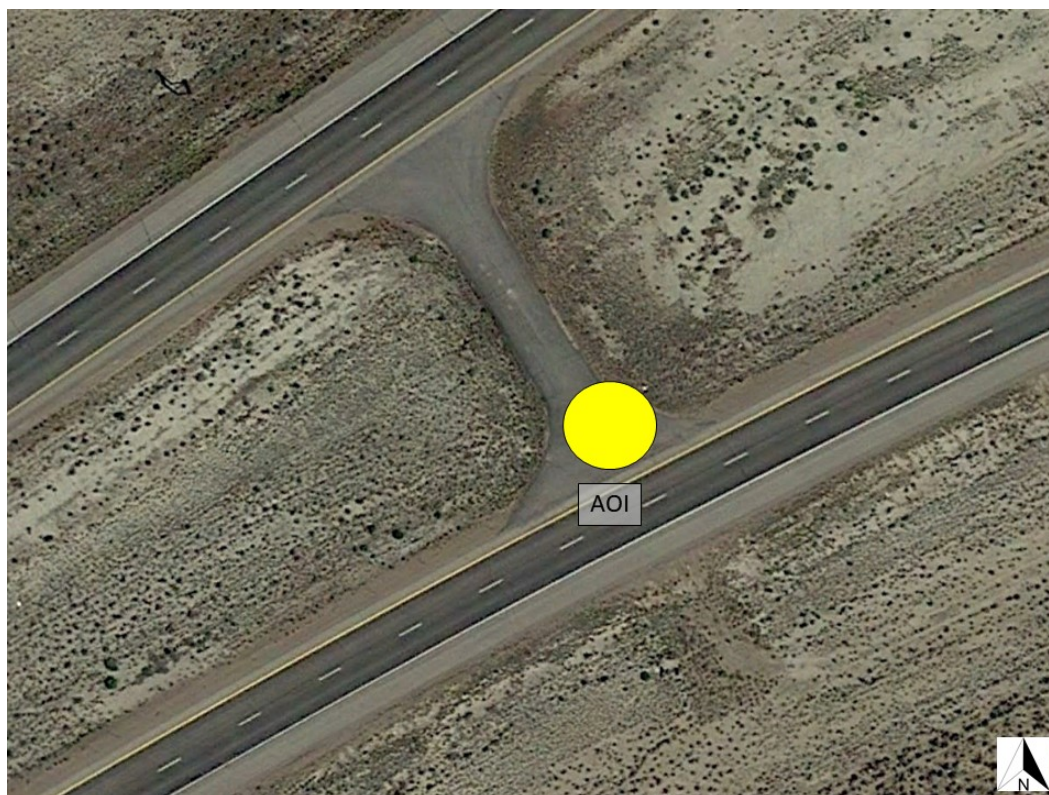


Figure 2 - Cross-Over (Google)

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**Vehicles:** The following details the vehicles involved in the accident including vehicle identification, specifications, and, if present, relevant damages.

**Freightliner Cascadia:** Vehicle 1 in the Wyoming Crash Report was a 2016 Freightliner Cascadia 6x4 tractor with a raised roof sleeper cab bearing the VIN 1FVXGF001GLGX5630. The vehicle was towing a 2010 53-foot 3000R Utility trailer, bearing the VIN 1UYVS2531BU892626, hauling apples. Provided photographs of the Freightliner are shown in Figure 3: the left image is the Freightliner and Utility trailer at their point of rest, and the right image is the Freightliner after it was towed from the scene. The damage to the Freightliner was concentrated to the front of the vehicle: the steer axle was displaced rearward and the fiberglass hood was damaged. The Freightliner was not available for inspection by Kineticcorp.



*Figure 3 - Freightliner Cascadia*

**Kenworth W900B:** Vehicle 2 in the Wyoming Crash Report was a 1996 Kenworth W900B 8x4 tractor with day cab bearing the VIN 1XKWPB0X6TS727915. The Kenworth was towing two trailers: the lead trailer was a 1998 Ranch Trailers 42' Belly Dump with a 21 cubic yard capacity bearing the VIN 1R9BSF608WL008184, and the second trailer was a 2000 Ranch Trailers 24' Belly Dump with a 12 cubic yard capacity bearing the VIN 1R9BP6507YL008683. Provided photographs of the Kenworth and trailers are shown in Figure 4.

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*Figure 4 - Kenworth W900B*

The left image is the Kenworth at rest with two trailers still attached; the right image was provided to KinetiCorp and is of the Kenworth after the vehicle was removed from the scene. The impact from the Freightliner to the driver side of the Kenworth, which was concentrated near the lift/tag axle, caused the frame of the Kenworth to bow. The Kenworth and both trailers were not available for inspection by KinetiCorp.

Accident Scene: KinetiCorp inspected the accident scene on June 5, 2019. At the time of the inspection, I-80 was in the process of resurfacing the roadway. Figure 5 is a photograph taken at the time of the inspection looking north at the cross-over in the median of I-80.

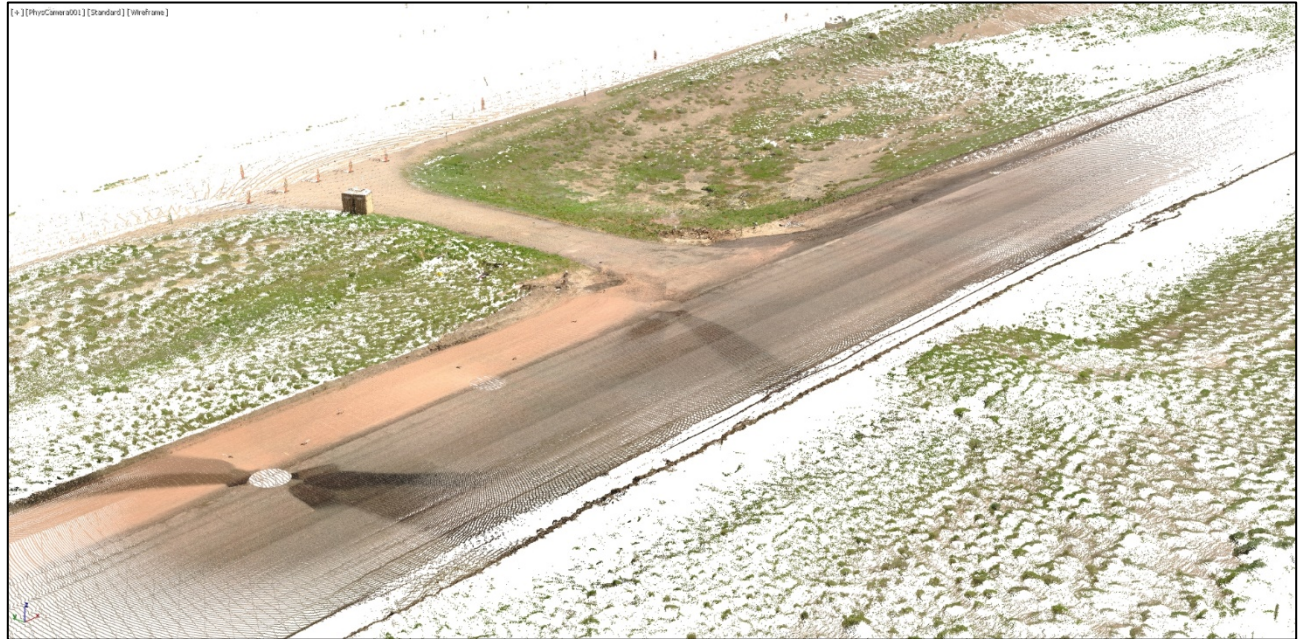


*Figure 5 – Area of Impact and Rest (6/5/19)*

KinetiCorp also performed a 3D laser scan survey of the scene. A total of nine scans were performed with more than 75 million points of data obtained. An image of the scaled 3D

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model created from the laser scans is shown in Figure 6; it is oriented so that the eastbound travel direction is from the bottom right to the top left.



*Figure 6 – Kineticorp Scaled 3D Scene Laser Scan*

Camera Matching Photogrammetry: Physical evidence present in provided scene photographs was analyzed using camera matching photogrammetry for accurate modeling of the accident scene. The physical evidence identified and located using photogrammetry was inserted in Kineticorp's scene diagram to analyze the collision. Photogrammetry is a process that uses principles of perspective to analyze and obtain three-dimensional data from photographs or video. These principles and techniques are widely accepted and used within the field of accident reconstruction and computer visualization<sup>1,2,3,4,5</sup>.

The photogrammetric process involves aligning the computer model with photographs such that the position and characteristics of the camera that took the image are matched in the computer environment with a computer-generated camera. Figure 7 and Figure 8 show provided photographs of the accident site matched with the 3D laser scans captured by Kineticorp, which allows for accurate extraction and location of physical evidence in the 3D computer environment. These photographs provided locations of tire marks and rest positions of involved vehicles after the collision.

<sup>1</sup> Fenton, S., Neale, W., Rose, N., Hughes, C., "Determining Crash Data Using Camera-Matching Photogrammetric Technique," Paper Number 2001-01-3313, Society of Automotive Engineers, 2001.

<sup>2</sup> Pepe, Michael D., et al., "Accuracy of Three-Dimensional Photogrammetry as Established by Controlled Field Tests," Society of Automotive Engineers Paper Number 930662.

<sup>3</sup> Brach, Raymond M., et al., Vehicle Accident Analysis and Reconstruction Methods, "Chapter 10: Photogrammetry," Society of Automotive Engineers, 2005.

<sup>4</sup> Rucoba, R., Duran, A., Carr, L., "A Three Dimensional Crush Measurement Methodology Using Two-Dimensional Photographs," Society of Automotive Engineers Paper Number 2008-01-0163.

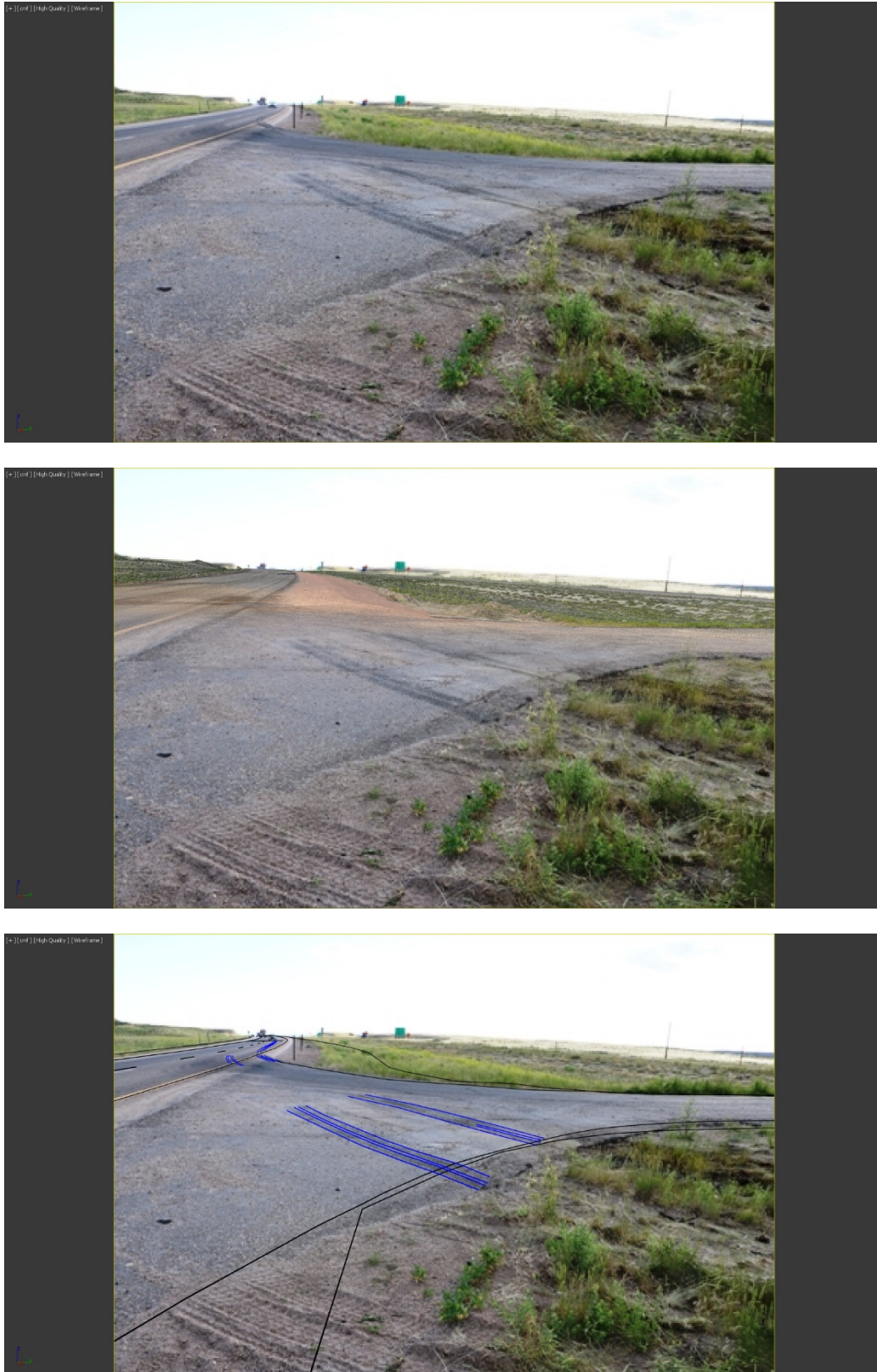
<sup>5</sup> Terpstra, T., Voitel, T., Hashemian, A., "A Survey of Multi-View Photogrammetry Software for Documenting Vehicle Crush," SAE, Paper 2016-01-1475, Society of Automotive Engineers, 2016.

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Figure 7 – Camera Matching Photogrammetry (IMG\_0177)

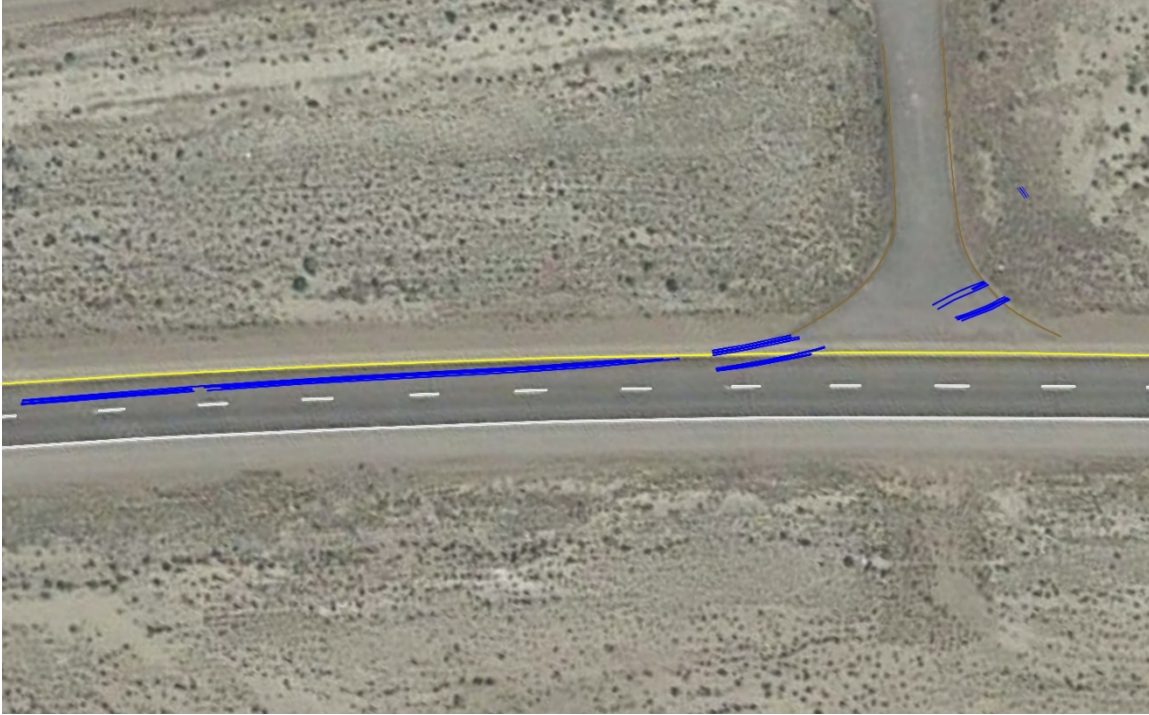
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*Figure 8 – Camera Matching Photogrammetry (SCENE (17))*

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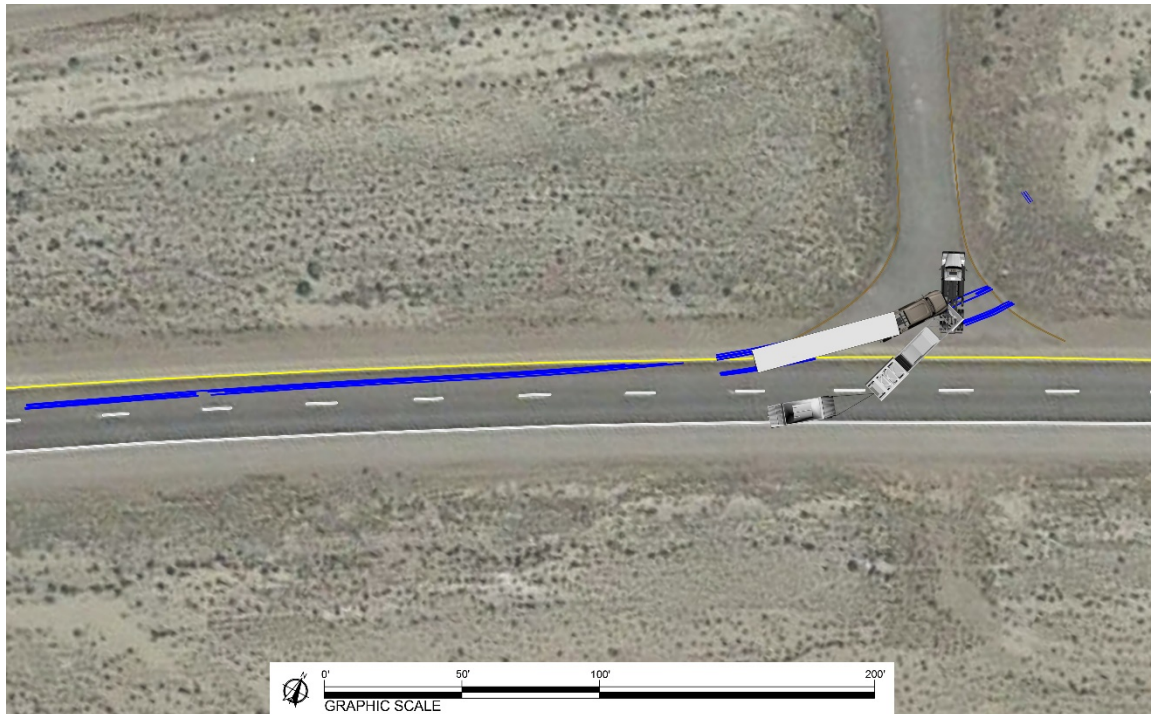
Impact and Rest Positions: The resulting 3D scene diagram, generated from the scene inspection 3D laser scans, photogrammetry analysis of provided photographs, and the police report was used to determine the pre-impact, impact, and rest positions of the Freightliner and Kenworth. Figure 9 shows the 3D scene diagram with camera-matched physical evidence.



*Figure 9 - 3D Scene Diagram – Camera-Matched Physical Evidence*

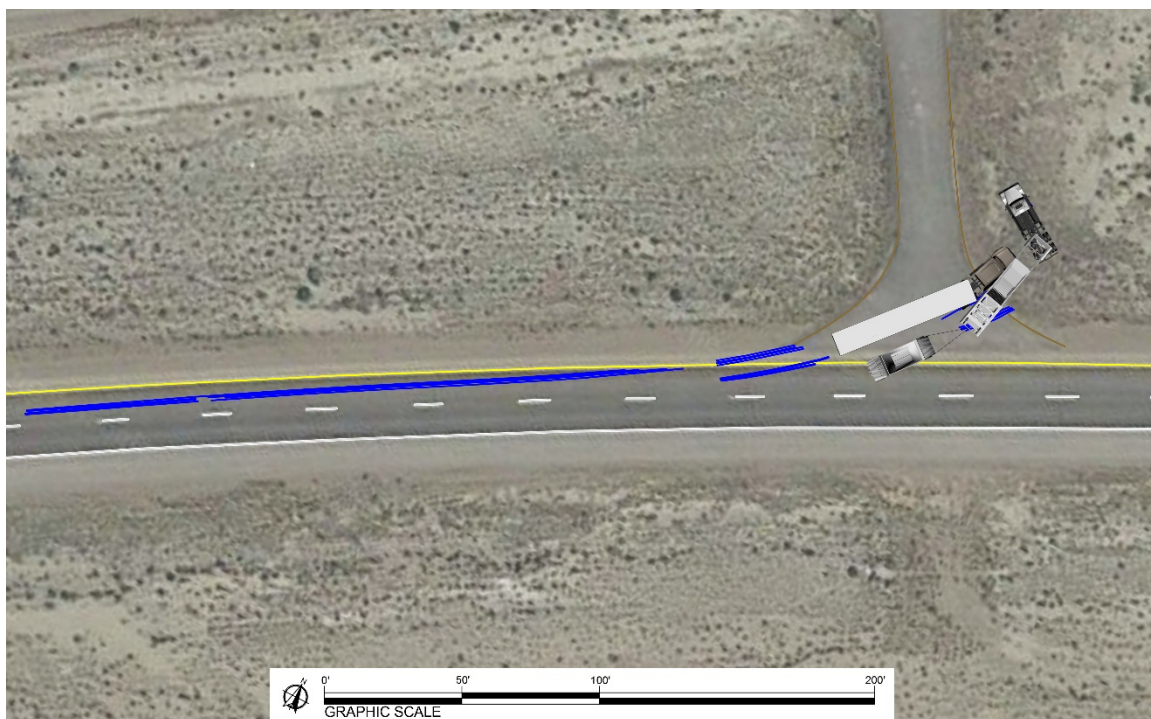
Figure 10 shows the vehicles at the point of maximum engagement during the collision, where the impact forces are transferred. The point of impact was approximately 20 feet north of the edge of pavement.

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*Figure 10 – 3D Scene Diagram – Point of Impact*

After impact, the vehicles traveled approximately 30-40 feet east into the median to their rest positions. Figure 11 shows the vehicles at their rest positions, obtained from camera matches of police photographs.



*Figure 11 – 3D Scene Diagram – Points of Rest*

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Impact Analysis: Analysis of the collision of the Freightliner into the Kenworth was performed based on the available scene evidence, including tire marks deposited by the Freightliner prior to impact, marks deposited by the vehicles after impact and the rest positions of the vehicles. The dynamics of the accident, the weights of the vehicles and the multiple articulations of the tractors and trailers, requires the use of simulation software that can accurately model the physics of the accident<sup>6,7,8</sup>. Utilizing simulation software to analyze vehicle collisions is a widely used and acceptable method of analysis in the field of accident reconstruction. Inputs to the simulation software include physical properties of the vehicles involved in the collision and their positions prior to, during, and after impact. Speeds and positions are iterated within the simulation to most closely match the physical evidence and damages to the involved vehicles.

The results of the analysis show that the Freightliner, driven by Shostak, was traveling 33 to 37 mph at impact while the Kenworth, driven by Buck, was traveling 8 to 10 mph. As a result of the impact, the Freightliner experienced a change in velocity (Delta-V) from 15 to 19 mph with a principal direction of force of approximately 8 degrees.

Exemplar Freightliner: As part of this investigation, an exemplar 2016 Freightliner Cascadia was inspected and documented on October 9, 2019, to determine the geometry of the interior and exterior of the vehicle. Figure 12 shows the exterior of the exemplar Freightliner and Figure 13 shows the rear sleeping area in the interior of the vehicle.

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<sup>6</sup> Cliff, W., and Montgomery, D., "Validation of PC-Crash – a Momentum-Based Accident Reconstruction Program," Paper Number 960885, Society of Automotive Engineers, 1996.

<sup>7</sup> Steffan, H., and Moser, A., "The Trailer Simulation Model of PC-Crash," Paper Number 980372, Society of Automotive Engineers, 1998.

<sup>8</sup> Bailey, Mark N., "Data from Five Staged Car to Car Collisions and Comparison with Simulations," Paper Number 2000-01-0849, Society of Automotive Engineers, 2000.

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*Figure 12 - Exemplar 2016 Freightliner Cascadia Tractor (Exterior)*



*Figure 13 - Exemplar 2016 Freightliner Cascadia Tractor (Interior)*

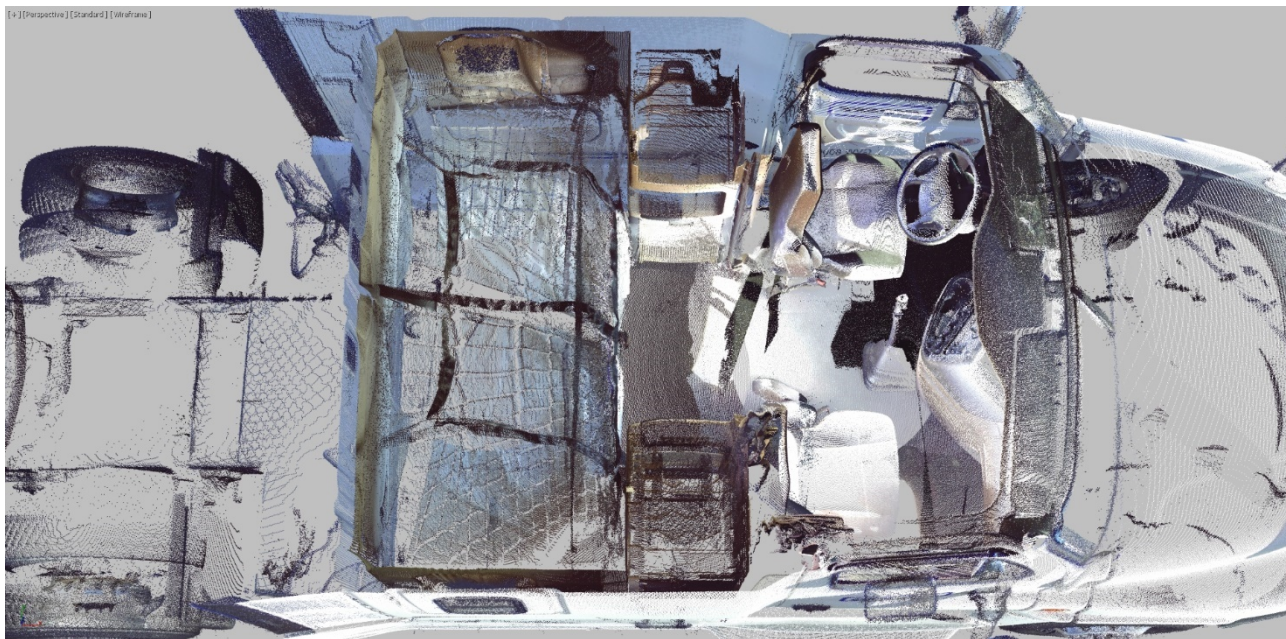
Kineticorp also performed 3D laser scans of the exterior and interior of the exemplar Freightliner. An image of the scaled 3D model of the exterior of the tractor created from the laser scans is shown in Figure 14.

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*Figure 14 - Scaled 3D Model of Exemplar Freightliner Cascadia (Exterior)*

The interior of the Freightliner was also included in the scaled model, including the sleeper berth area and netting. Figure 15 shows the scanned interior model.



*Figure 15 - Scaled 3D Model of Exemplar Freightliner Cascadia (Interior)*

Furthermore, Kineticorp built a scaled 3D geometric model of the interior of the exemplar Freightliner's cab utilizing Autodesk 3D Studio Max. The geometric model includes a dimensionally accurate recreation of the sleeper berth, including the bedding, netting, and storage compartments on both sides of the entrance. Figure 16 shows the geometric model of the sleeper berth of the exemplar Freightliner.

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*Figure 16 – Scaled Geometric Model of Exemplar Freightliner Cascadia (Interior)*

The geometric model of the interior of the Freightliner was utilized for further analysis of the motion of the occupants during the collision by Sarah Sharpe, Ph.D., a Biomechanical Engineer.

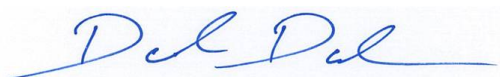
**Conclusions:** Based on the available evidence, testimony, and this engineer's training, education, and experience, the following conclusions were reached:

- The Freightliner was traveling approximately 30-35 mph at the time of impact to the Kenworth.
- The Kenworth was traveling approximately 8-10 mph at the time of impact from the Freightliner.
- The Freightliner experienced a Delta V of approximately 15-19 mph during the impact.
- The PDOF to the Freightliner during the impact was approximately 8 degrees.

**Closing:** The opinions and conclusions expressed in this report were reached to a reasonable degree of engineering certainty and are based on the evidence available to this engineer as of the date of this report. This engineer reserves the right to amend and/or supplement the conclusions contained within this report as additional information becomes available.

Sincerely,

KINETICORP, LLC.



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David A. Danaher, P.E.  
Principal Engineer  
ACTAR # 967  
NAFE (Fellow) # 703F

## Appendix A: List of Provided Documents

- **Deposition Transcripts ( \* *with Exhibits* )**
  - Buck, Jason (8/7/19) \*
  - Shostak, Pavlo (9/23/19)
  - Shostak, Lyudmyla (9/23/19)
  - Waller, Michael (8/7/19)
- **Photographs**
  - Photographs of netting in Pavlo's new truck – 6 photos
  - Site and Truck photos – 49 photos
  - PHOTO 00038-45 Jason Buck x-8 Photos 1391378 – 8 photos
  - PHOTO 00046-70 Kenworth Belly Dump Trailer taken by Mike Waller x-25 1391379
  - PHOTO 00089-93 Shostak x-5 1391714
  - PHOTO 00094-101 Freightliner x-8 RPM.Carolina (Franklin Shardin 1392064
  - PHOTO 00102-118 06.28.17 Freightliner Adjuster Am Trust x-17 1408775
  - Exemplar Vehicle Photos - 155 images
  - 1906356\_110819\_Photos\_1pp
  - 1906356\_110819\_Photos\_4pp
  - PHOTO WHP Crash Photos #155-#191 x 37 – 37 photos
  - Ex 002 Google View of Accident Site 1490590
  - Ex 003 Another Google View Accident Site 1490598
  - Ex 004 Jason Buck Transcribed Recorded Statement 1490596
  - Ex 011 Google Aerial Map (Potter) 1523911
  - Ex 012 Google Earth Photo Showing Distance to Crest 1490611
- **Legal Documents**
  - Complaint 1377144
  - Def. Waller's Truck Company, Inc. and Jason R. Bucks' Answer and Affirmative Defenses 1391989
  - Defendant Kilgore Companies Answer to Complaint 1385029
  - Ex 005 WHP Highway Patrol Accident Report 00001-12 06.28.17 0720 1490661
  - Ex 020 Pavlo Answer to Waller's First Interrogatories 1546444
  - Lyudmyla Shostak Answers to Waller First Interrogatories 1488133
- **Expert Files**
  - Expert Witness Designation without exhibits (10/16/19)
  - "Freightliner Follow" Animation
  - "Top View" Animation
  - "View 01 wireframe" Animation
  - "View 01" Animation Michael McCort, MS, PE Evaluation Analysis & Accident

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## Reconstruction 1557226

- **Expert Reports**

- Michael McCort, MS, PE Evaluation Analysis & Accident Reconstruction 1557226

- **Documentation**

- Ex 019 Pavlo Shostak Transcribed Recorded Statement 2019 03 22 1546435  
Ex 061 Recorded Statement Lyudmyla Shostak WALL 15-32 1547928

- **Other Documents**

- Ex 018 End of Zone - Construction hand drawing Potter 1523905



Résumé of  
**DAVID A. DANAHER, P.E.**  
 Principal Engineer

**Kineticorp™**

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 ddanaher@kineticorp.com

#### **EMPLOYMENT HISTORY:**

Principal Engineer, Kineticorp, LLC, Colorado, January 2014 to Present  
 Principal Engineer, Veritech Consulting Engineering, LLC, Castle Rock, Colorado, April 2008 to October 2013  
 Director, Mechanical Engineering, Knott Laboratory, LLC, Centennial, Colorado, April 2005 to April 2008  
 Senior Engineer, Knott Laboratory, Inc., Centennial, Colorado, June 2000 to April 2005.  
 Engineer, Knott Laboratory, Inc., Denver, Colorado, June 1996 to April 2000.

#### **REGISTRATIONS:**

Registered Professional Engineer in the State of Colorado, Wyoming, Nevada, and Texas (P.E.)  
 Board Certified in Forensic Engineering by the National Academy of Forensic Engineers, Fellow (NAFE)  
 Accredited Traffic Accident Reconstructionist (ACTAR)  
 National Council of Examiners for Engineers and Surveying Record Holder (NCESS)

#### **EDUCATION:**

B.S., Mechanical Engineering, Vehicle Design Specialty, University of Colorado at Denver, Colorado, 1998

**ENGINEERING AND DESIGN:** As a mechanical engineer, Mr. Danaher has experience in the areas of mechanical design and operation as well as failure analysis. His experience also involves product design evaluation, strength of materials analysis, and failure mechanics. He has performed evaluations in the areas of pressure vessels, machine design, and thermal and fluid systems. Mr. Danaher has evaluated and analyzed heavy equipment such as skid steer loaders, motor graders, oil field equipment, off road/on road forklifts, and front-end loaders. Mr. Danaher has also investigated commercial production processes throughout the country. These evaluations included safety systems, design and operation, as well as maintenance related issues. Mr. Danaher has also worked with government agencies including OSHA to determine system failures and operator interaction on heavy equipment.

**ACCIDENT RECONSTRUCTION:** Mr. Danaher has extensive experience performing vehicle accident investigations throughout the United States. His hands-on investigative experience includes inspections of passenger cars, motorcycles, trucks, tractor trailers, commercial vehicles and bicycles. He is experienced in analysis of vehicle speeds, crush energy, braking systems, motorcycle braking and performance, driver reaction, time-space analysis, and dynamics. Mr. Danaher has also been trained and certified on downloading and interpreting ACM and ECM ("black box") data from passenger and commercial vehicles. He has investigated and analyzed hundreds vehicular accidents and applies his knowledge of vehicle dynamics, simulation, crush energy, momentum, and driver response to accident reconstruction. Frequent aspects of these investigations involve analysis of brakes, tires, seat belts, airbags, and other vehicle systems. Mr. Danaher also has working experience with engine, drivetrain, and suspension failure analysis. In addition, Mr. Danaher has evaluated accidents involving recreational activities and equipment. Mr. Danaher has also authored publications related to forensic engineering for the Society of Automotive Engineers (SAE) and the National Academy of Forensic Engineers (NAFE). Mr. Danaher has also presented numerous seminars regarding vehicle accident investigations and reconstruction, product design and failure analysis, seat belts and airbags, and occupant kinematics. Mr. Danaher and his accident reconstruction expertise have been featured several times on local and national television including NBC, MSNBC, and CBS.

**EXPERT TESTIMONY:** As a result of his investigations and experience, Mr. Danaher has been qualified as an expert witness in cases nationwide and has provided expert testimony in both State and Federal Courts.

**PROFESSIONAL AFFILIATIONS:** National Academy of Forensic Engineers, Fellow (NAFE), National Society of Professional Engineers (NSPE), Accreditation Commission for Traffic Accident Reconstruction – Full Accreditation (ACTAR), Society of Automotive Engineers (SAE), National Association of Professional Accident Reconstruction Specialists (NAPARS), American Society of Mechanical Engineers (ASME) - American Society of Materials (ASM), American Society of Agricultural and Biological Engineers (ASABE). Mr. Danaher participated as a member of several SAE Standards Committees, including Reconstruction Information Resources, Investigation Techniques, Vehicle-Road Friction, and Pedestrian Accidents. Commercial Vehicle Safety Alliance (CVSA), Vehicle Committee Member. OSHA GI training.

## PUBLICATIONS

1. **Danaher, D.**, McDonough, S., and Donaldson, D., "Two Phase Heavy Truck Acceleration Model," SAE Technical Paper, 2019-01-0411, 2019, doi:10.4271/2019-01-0411.
2. **Danaher, D.**, Neale, W., McDonough, S., and Donaldson, D., "Low Speed Override of Passenger Vehicles with Heavy Trucks," SAE Technical Paper, 2019-01-0430, 2019, doi:10.4271/2019-01-0430.
3. McDonough, Sean, **David Danaher**, William Neale. "Mid-Range Data Acquisition Unites Using GPS and Accelerometers." SAE Paper 2018-01-0513. (2018).
4. Rose, Nathan, Neal Carter, John Kreisher, Martin Randolph, William Neale, **David Danaher**, "How Accurate Are Witness Distance Estimates Given in Car Lengths?" Collision: The International Compendium for Crash Research, Volume 11 Issue 1, 2016. (2016).
5. Neale, William T., **David A. Danaher**, Sean M. McDonough. "Data Acquisition Using Smart Phone Applications." SAE Paper 2016-01-1461. (2016).
6. **Danaher, David A.** "Forensic Engineering Analysis of Safety Shooting Glasses Subject to Ballistic Impact" Journal of the National Academy of Forensic Engineers. (December 2011).
7. Ball, Jeffrey K., **David A. Danaher**, Trevor J. Buss. "Full-Scale Testing and Analysis of Tractor-Trailer Braking Performance with and without Trailer Anti-Lock Brakes." SAE Paper 2010-01-1891. (2010).
8. **Danaher, David A.**, Trevor J. Buss, Jeffrey K. Ball. "Operation of the Eaton VORAD Collision Warning System and Analysis of the Recorded Data." SAE Paper 2009-01-2911. (2009).
9. Ball, Jeffrey K., **David A. Danaher**, Richard M. Ziernicki. "A Method for Determining and Presenting Driver Visibility in Commercial Vehicles." SAE Paper 2007-01-4232. (2007).
10. Ziernicki, Richard M., Jeffrey K. Ball, **David A. Danaher**. Richard M. Ziernicki. "Forensic Engineering Evaluation of Physical Evidence in Accident Reconstruction." Journal of the National Academy of Forensic Engineers. (July 2007).
11. Ball, Jeffrey K., **David A. Danaher**, Richard M. Ziernicki. "Considerations for Applying and Interpreting Monte Carlo Simulation Analyses in Accident Reconstruction." SAE Paper 2007-01-0741. (2007).
12. Ziernicki, Richard M., **David A. Danaher**.. "Forensic Engineering and the Use of Computer Animations and Graphics." Journal of the National Academy of Forensic Engineers. (December 2006).
13. Palmer, John A., **David A. Danaher**. "A Series of Preventable Events Leads to a Power Plant Explosion." EC&M (Nov. 2004).
14. **Danaher, David A.**, Wendy S. Johnson, Ben T. Railsback, and Richard M. Ziernicki. "A New Polycarbonate and Glass Laminate and its Effects on the Relationship Between Residual Tensile Stresses and Impact Resistance of Windshields." Society of Automotive Engineers paper for the International Body Engineering Conference & Exhibition (IBEC) and The Automotive & Transportation Technology Congress (ATT) Paper number 2002-01-1991 (Jul. 2002).

## TRAINING, TECHNICAL CONFERENCES AND SEMINARS

1. National Academy of Forensic Engineers Conference (NAFE) – Analysis of a Wheel Spindle Failure due to Pre-Load and Fatigue, The Application of Matchmoving for Forensic Video Analysis of a Fatal Sprint Car Accident, Analysis of a Crash Caused by Swingout of an Articulated Booster on a Semi-Trailer, Forensic Engineering Investigation of the Catastrophic Breakdown of a Diesel Engine an Emergency Generator Set, Analysis of a Fatal Overhead Crane Accident, Analysis of a Failed Roll-Over Protective Structure (ROPS), Forensic Engineering Investigation of a Self-Unloading Boom Collapse on a Great Lakes Freighter, Friction or Fiction: The Changing World of Slip-and-Fall Analysis. Denver, CO. July 27-28, 2019.
2. Society of Automotive Engineers (SAE) World Congress – Reconstruction of 3D Accident Sites Using USGS LiDAR, Aerial Images, and Photogrammetry; The Application of Augmented Reality to Reverse Camera Projection; Inter-Vehicular Sliding Friction; Passenger Vehicle Response and Damage Characteristics of Front and Rear Structures during Low to Moderate Speed Impacts; Passenger Vehicle Dynamic Response and Characterization of Side Structure during Low to Moderate Speed Side

Impacts; Using Adjusted Force-Displacement Data to Predict the EBS of Car into Barrier Impacts, Detroit, Michigan, April 9, 2019.

3. National Academy of Forensic Engineers Conference (NAFE) – CALSPAN, Failure of Large Marine Propeller Shaft, Apartment Freezing Sequence Using Heat Flow Equations, Computer Fire Modeling and the Law, Analysis of Video Screens, Right Turning Trucks Impacting Bicyclists, Forensic Issues that Arise from Recirculating Hot Water Systems, Failure of Plastic Pool Chlorinators, Machine Safe Guarding, Crash Testing of Forensic Engineering Investigations, Trail Testimony, Application of Professional Surveying. Buffalo, NY. July 28-29, 2018.
4. “Advanced Crash Reconstruction Utilizing Human Factors” Northwestern University. Training and Certification Course. Understanding driver response terms and definitions, Common causes for response delays, Whether weather influences driver response, Evaluating a response during nighttime driving, Nighttime response scenarios and documenting nighttime crashes, Headlight beam analysis, Evaluating path intrusion crashes, Acceleration rate of drivers, Gap acceptance, Driver search patterns, Driver response to lead vehicles, traffic signals and decision making, Effects of fatigue and alcohol, Tutorial on IDRR and V\*Star software. Evanston, IL. May 15-19, 2017.
5. “Vehicle Crash Reconstruction Methods” Training and Certification Course. Society of Automotive Engineers (SAE). Straight-Line Motion, Point Mass Collisions (COLM, Conservation of Linear Momentum), Planar Impact Mechanics (PIM), Class exercises using VCRware software, Crush and Tangential Energy Loss, Event Data Recorder (EDR) Technology, Crash Reconstruction using EDR Data, Planar Impact Mechanics and Spreadsheet Optimization Techniques, Frontal Vehicle-Pedestrian Collisions, Planar Photogrammetry, Mechanics and Modeling of Tire Forces, Critical Speed from Tire Yaw Marks, Articulated Vehicle Impact, Topics from Vehicle Dynamics. Scottsdale, AZ. Sept. 28-30, 2016.
6. ARC-CSI Crash Conference – Motorcycle Crash Testing (27), Vehicle Crash Testing, IIHS Driver and Passenger-Side Crash Test Comparison, Photography for Crash Reconstruction, Analysis using NHSTA NASS Crash Data, Working Around Electric Vehicles, Motorcycle Reconstruction Techniques, Evaluation of Pre-Crash Braking, Evaluating Wheel Impacts in Rollovers, Lateral Acceleration Through a Curve, When do Airbags Deploy, 30. Las Vegas, NV. May 23-26, 2016.
7. “Heavy Vehicle Crash Reconstruction” Northwestern University. Training and Certification Course. Heavy Vehicle nomenclatures, Air Brakes Systems, ABS Braking Systems, Front Axle Brakes and Proportioning Valves, Special Component Issues, Data Collection, Conspicuity, Speed Analysis, Collision behavior, momentum and damage. Event Data Recorders (Basics), Off-tracking, Rollover, Computer analysis, Field testing and analysis, Heavy Vehicle Tire Stamping. Evanston, IL. May 11-15, 2015.
8. “Crash Data Retrieval (CDR) Analysis and Applications Course”. Training and Certification Course. Golden, CO. April 13-14, 2015.
9. “Motorcycle Crash Reconstruction” Northwestern University. Training and Certification Course. Motorcycle nomenclatures, Characteristics of motorcycle tires and wheels, Motorcycle braking systems, Motorcycle electronic control units and air bag systems, Roadway factors, Operator and passenger factors, Motorcycle and rider conspicuity, Motorcycle helmets, Motorcycle dynamics, Velocity determination, Computer analysis, Field testing and analysis, and Case studies. North Las Vegas, NV. April 6-10, 2015.
10. Motorcycle Safety Foundation Riders Course. Training and Certification Course. T3RG Aurora, CO. June 28-29, 2014.
11. “10-hour Occupational Safety and Health Training Course in General Industry Safety Industry” Certification Course. Hazmat Plans & Programs (HP&P). Aurora, CO. May 29-30, 2014.
12. Commercial Vehicle Safety Alliance (CVSA) Workshop: Building a Brighter Future: Quality, Uniformity and Consistency in CMV Safety and Enforcement Conference. Los Angeles, CA. April 6-10, 2014.
13. “Accessing and Interpreting Heavy Vehicle Event Data Recorders” Training and Certification Course. Society of Automotive Engineers (SAE). Oxnard, CA. Oct. 23-26, 2012.
14. "Vehicle Accident Reconstruction." Society of Automotive Engineers (SAE). Seminar: International Congress and Exposition. Cobo Hall. Detroit, MI. April 12-13, 2011.
15. “Essentials and Expert Training using PC-Crash Including Accelerated Essentials Survey and Advanced Special Topics”

Training and Certification Course. Orlando, FL. April 6-8, 2011.

16. ARC-CSI Crash Conference – Vehicle Crash Testing, PDOF and Angle Development Over Time, GM OnStar, Accelerometers and Other Devices, Motorcycle Accident Reconstruction, Low Speed Crash Analysis, Motion Equations, Commercial Motor Vehicle Forensic Inspection, Delta-V, Finding Speed or Acceleration from Video, Impact Speed and Post-Collision Speedometer Readings, GPS, Conspicuity Sheeting, Retro Reflective Tape Wear. Las Vegas, NV. May 24-27, 2010.
17. "Vehicle Accident Reconstruction." Society of Automotive Engineers (SAE). Seminar: International Congress and Exposition. Cobo Hall. Detroit, MI. 20-22 Apr. 2009.
18. "Crash Data Retrieval System Operator's Certification Course Series: CDR Technician Course; CDR Data Analyst Course" Certification. Bosch approved, conducted by Collision Safety Institute (CSI). Training and Certification Course. Des Moines, IA 9-13 Mar. 2009.
19. NJAAR Annual Joint Conference – Lateral Pole Collisions, Commercial Vehicle: Event Data Recorders, Critical Speed Yaw, Under Influence and Driving, Perception/Reaction, Airborne Analysis, Vehicle Event Data Retrieval EDR. Atlantic City, NJ. October 15-17, 2008.
20. AIRP Standard Committee Meeting. "Society of Automotive Engineers (SAE). Seminar: International Congress and Exposition. Cobo Hall. Detroit, MI. 18 Apr. 2007.
21. "Commercial Vehicle Braking Systems." Society of Automotive Engineers (SAE). Training and Certification Course. Detroit, MI. 16- 18 Apr. 2007.
22. "Vehicle Accident Reconstruction." Society of Automotive Engineers (SAE). Seminar: International Congress and Exposition. Cobo Hall. Detroit, MI. 3-5 Apr. 2006.
23. "EDC Reconstruction." Engineering Dynamics Corporation. Training and Certification Course. Northridge, CA. 21-25 Jan. 2002.
24. "EDC Simulations." Engineering Dynamic Corporation. Training and Certification Course. Northridge, CA. 22-26 Jan. 2001.
25. "Acceleration and VC2000PC Training Course." Vericom Computers. Greenwood Village, CO. 27 Jun. 2000.
26. "The Role of Computers in Accident Reconstruction." Knott Laboratory, Inc. Centennial, CO. 14 Mar. 2000.
27. "Vehicle Accident Reconstruction." Society of Automotive Engineers (SAE). Seminar: International Congress and Exposition. Cobo Hall. Detroit, MI. 6-9 Mar. 2000.
28. "The Role of Computers in Accident Reconstruction." Knott Laboratory, Inc. Centennial, CO. 26 Oct. 1999.
29. "High Speed Accident Investigations." Presenter. Knott Laboratory, Inc. Centennial, CO. 14 Oct. 1999.
30. "Courtroom Use of Photogrammetry, 3-D Computer Modeling and Animation." Knott Laboratory, Inc. Centennial, CO. 15 Apr. 1999.
31. "Damaged Roof Evaluation: What Every Adjuster Should Know." Knott Laboratory, Inc. Centennial, CO. 7 Apr. 1999.
32. "Medical and Biomechanical Evaluation of Injuries." Knott Laboratory, Inc. Denver, CO. 31 Mar. 1999.
33. "High Speed Accident Investigation." Knott Laboratory, Inc. Centennial, CO. 25 Mar. 1999.
34. "Accident Reconstruction Using Conservation of Momentum & Energy." Training and Certification Course. Society of Automotive Engineers (SAE) Professional Development Program. Detroit, MI. Dec. 1998.
35. "Foundation Failure and Water Problems." Knott Laboratory, Inc. Centennial, CO. 15 Oct. 1998.
36. "Biomechanical and Medical Evaluation of Injuries." Knott Laboratory, Inc. Centennial, CO. 14 Oct. 1998.
37. "Product Failure and Malfunction." Knott Laboratory, Inc. Centennial, CO. 8 Oct. 1998.

38. "Accident Reconstruction: State of the Art Technologies." Knott Laboratory, Inc. Centennial, CO. 7 Oct.1998.
39. "Product Liability." Knott Laboratory, Inc. Centennial, CO. 9 Apr. 1998.
40. "Seatbelts and Airbags: Current Technology." Knott Laboratory, Inc. Centennial, CO. 19 Mar.1998.
41. "Low Speed Accident Investigations." Knott Laboratory, Inc. Centennial, CO. 23 Oct. 1997.
42. "Seatbelt and Airbag Investigation." Knott Laboratory, Inc. Centennial, CO. 16 Oct. 1997.
43. "Accident Investigation and Reconstruction." Knott Laboratory, Inc. Centennial, CO. 2 Oct. 1997.

#### INVITED LECTURES

1. "Analysis of a Wheel Spindle Failure due to Pre-Load and Fatigue" Speaker. National Academy of Forensic Engineers (NAFE), Technical Paper Presentation, NAFE Annual Meeting, July 27, 2019
2. "Low Speed Override of Passenger Vehicles with Heavy Trucks" Speaker. Society of Automotive Engineers Technical Paper Presentation, Society of Automotive Engineers World Congress, Detroit Michigan, April 9, 2019
3. "Low Speed Override of Passenger Vehicles with Heavy Trucks" Panel Member. American Bar Association – Transportation Megaconference XIV Trucking and Motor Carrier Litigation. New Orleans, LA. March 22, 2019
4. "Black Box, Drive Cam, and GPS Data Available in Modern Vehicles" Speaker. Safety and Technical Training Conference, (RMEL). Lone Tree, CO. April 22, 2015.
5. "Forensic Engineering Evaluation of Physical Evidence in Accident Reconstruction." Speaker., National Academy of Forensic Engineers (NAFE), Technical Paper Presentation, NAFE Annual Meeting. Denver, CO. 28 Jul. 2007.
6. "Seatbelts & Airbags: Current Technology." Presenter. Vehicular Accident Reconstruction Insurance Seminar. Knott Laboratory, LLC. Centennial, CO. 2 Mar. 2006
7. "Accident Reconstruction: Expert Opinions in Visual Form." Presenter. Kansas Bar Association CLE Meeting. Vail, CO. 10 Jun. 2005.
8. "Vehicle Accident Reconstruction." Presenter. Insurance Claims Seminar. Knott Laboratory Inc. Centennial, CO. 6 May 2004.
9. "The Use of Animation in Litigation." Presenter. Southeast Metropolitan Law Club. Englewood, CO. 4 Nov. 2003.
10. "A New Polycarbonate and Glass Laminate and its Effects on the Relationship Between Residual Tensile Stresses and Impact Resistance of Windshields." Presented paper number 2002-01-1991. Society of Automotive Engineers International Body Engineering Conference & Exhibition (IBEC) and The Automotive & Transportation Technology Congress (ATT). Paris, France. 9 Jul. 2002.
11. "Forensic Engineering: Product Liability." Presenter. Travelers Insurance Claims Seminar. Englewood, CO. 7 Jun. 2002.
12. "Forensic Engineering: Product Liability." Presenter. Travelers Insurance Claims Seminar. Englewood, CO. 7 Jun. 2002.
13. "Forensic Engineering: Buildings, Bumpers and Bodies." Presenter. White & Steele, P.C. Wyoming Insurance Claims Seminar. Radisson Hotel. Aurora, CO. 4 Feb. 2002.
14. "Vehicular Accident Reconstruction." Presenter. Knott Laboratory, Inc. Centennial, CO. 14 Mar. 2000.
15. "New Technologies in Accident Reconstruction." Presenter. Society of Automotive Engineers (SAE), Colorado Section Meeting. Knott Laboratory, Inc. Centennial, CO. 19 Jan. 2000.
16. "Seatbelt and Air Bag Investigation." Presenter. Knott Laboratory, Inc. Centennial, CO. 12 Sept. 2000.

#### **FUNDED AND SUPPORTED RESEARCH**

1. "Video Analysis of Concussion Causing Events in Professional Football." Sponsored by the National Football League (NFL). 2017
2. "Speak up to Slow Down" Wisconsin State National Campaign Against Speeding. Ongoing funding through Score One Production. 2013-present

#### **MEDIA APPEARANCES**

1. "Street Racing Accident in Aurora, Colorado." Channel 4 News. CBS. 10 May 2006.
2. "Knott Laboratory Feature by Business Reporter, Greg Moss." Channel 9 News Morning Show. NBC. 4 Nov. 2004.
3. "How Technology and Animation Work Together to Aid in Forensic Analysis." Channel 4 News. CBS. 8 May 2003.
4. "Out of Control: Why Cars Crash." MSNBC. 2000/2001.

**2019 RATE SHEET**

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<b>David Danaher</b>	\$ 260.00
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Mileage: 58¢ per mile

Rates subject to change without notice



## Expert Testimony For Mr. David A. Danaher, P.E.

Testified	Trial	Hrng	Arb	Depo	Job Number	Job Name	Description	Case No.	Dist/City/State
2014									
2/5/2014				X	2199-0114	Olson	Ironstone v. Peerless	12CV3160-CMA-KMT	United States District Court District of Colorado
5/27/2015				X	2212-0114	Pahike	Shannon Jones v. Union Pacific Railroad	CI12-685	District Court, Scottsbluff County, NE
11/19/2014				X	2327-0714	Miller	Barwok v. Moore Brothers	14 CV 00203 RLV	United States District Court, Atlanta, GA
Year Count	0	0	0	3					
2015									
2/11/2015				X	2341-0814	Stevens	Moore v. Crabtree	14-cv-00143-REB-MJW	United States District Court Denver, CO
6/10/2015				X	2296-0514	Barron	Gonzalez v. Republic Silver State Disposal	A-13-692547-C	United States District Court Clark County, NV
8/11/2015				X	2297-0614	Malone	Ehlert v. Basic Energy Services	2014 CV 4	District Court, Stafford County, KS
Year Count	0	0	0	3					
2016									
1/27/2016	X				2297-0614	Malone	Ehlert v. Basic Energy Services	2014 CV 4	District Court, Stafford County, KS
2/22/2016				X	2608-0815	Barron	Republic Silver State Disposal adv. Rojas	A-14-704467-C	District Court, Clark County, NV
3/22/2016				X	2690-1015	Long	Teresa Walker v. BNSF	D21CI130000704	District Court, Scotts Bluff County, NE
12/13/2016				X	2861-0616	Murtaugh	Araujo v. City of San Jacinto	RIC1411590	Superior Court State of California County of Riverside, Central District
Year Count	1	0	0	3					
2017									
7/14/2017				X	2655-0915	Barron	Delgado v. Republic Silverstate Disposal, Inc	A-16-732255-C	District Court, Clark County, NV
Year Count	0	0	0	1					
2018									
				X	2523-0515	Scordalakis	McGurn v Wheat, et al.	RG14-736156	Superior Court State of California Alameda County, CA
Year Count	0	0	0	1					
2019									
11/7/2019				X	3205-0817	Hathcoat	Hamilton v. Kemper	17-vc-00882-MSK-STV	District Court of Colorado Denver, CO
9/5/2019				X	3367-0218	O'Neil	Miramontes v. UPS	BC661807	Superior Court State of California Los Angeles, CA
8/22/2019				X	3205-0817	Hathcoat	Hamilton v. Kemper	17-vc-00882-MSK-STV	District Court of Colorado Denver, CO
1/29/2019	X				2690-1015	Long	Walker, Teresa v. BNSF	D21CI130000704	District Court, Scotts Bluff County, NE
Year Count	1	0	0	3					

Total for Mr. Danaher since 2014				
Trial	Hrng	Arb	Depo	Total Times Testified
2	0	0	14	16